

sideration of the following detailed description and attached drawing, wherein:

FIG. 1 is a plan view of the disc changer according to the invention;

FIG. 2 is a cross-sectional view taken along line 2—2 of FIG. 1 showing the robot arm positioned in the play position;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 1 also showing the robot arm in the play position;

FIG. 4 is a cross-sectional view taken along line 4—4 of FIG. 3 showing the cam that controls the operation of the robot arm;

FIG. 5 is a partial view taken along line 5—5 of FIG. 3 also showing the cam that controls the robot arm;

FIG. 6 is a perspective view of the driven member that cooperates with the cam to form a clutch that drives the robot arm and operates a switch that applies power to the arm driving motor;

FIG. 7 is a cam profile of the cam that lifts and rotates the robot arm;

FIG. 8 is a perspective view of the pick-up head that engages the center hole of a disc;

FIG. 9 is a cross-sectional view taken along line 9—9 of FIG. 3 showing details of the pick-up head of the robot arm;

FIG. 10 is a cross-sectional view taken along line 10—10 of FIG. 9 showing further details of the pick-up head of the robot arm when the robot arm is in the play position;

FIG. 11 is an enlarged cross-sectional view of one of the pins in the pick-up head of the robot arm;

FIGS. 12—14 are cross-sectional views of the pick-up head of the robot arm taken along line 12—12 of FIG. 1 showing the operation of the pick-up head when a disc is discarded at the discard station;

FIG. 15 is a cross-sectional view taken along line 15—15 of FIG. 12 showing the pick-up pins of the pick-up head in a disc engaging position;

FIG. 16 is a cross-sectional view taken along line 16—16 of FIG. 13 showing the pick-up pins shown in a disc releasing position;

FIGS. 17—19 are cross-sectional views taken along line 17—17 of FIG. 1 illustrating the operation of the pick-up head of the robot arm during pick up of a disc at the pick-up station;

FIG. 20 is a cross-sectional view taken along line 20—20 of FIG. 17 showing the spindle at the pick-up station;

FIG. 21 is a perspective view, partially in cross section, showing details of the spindle at the pick-up station;

FIG. 22 is an enlarged view showing a typical disc pick-up operation;

FIG. 23 is a perspective view showing the locus of motion of the robot arm and pick-up head during a complete cycle from the play station to the discard station to the loading station and back to the play station;

FIG. 24 is a plan view of an alternative embodiment of the disc changer according to the invention;

FIG. 25 is a cross-sectional view taken along line 25—25 of FIG. 24 illustrating a disc positioned in the play position;

FIG. 26 is a partial view taken along line 26—26 of FIG. 25 showing the cam that controls the vertical motion of the carousel;

FIG. 27 is a cross-sectional view similar to FIG. 25 showing a disc positioned in the carousel with the carousel in a raised position over the play station;

FIG. 28 is a cross sectional view taken along line 28—28 of FIG. 27 showing an indexing mechanism for the carousel;

FIG. 29 is a cam profile of the cam that lifts and rotates the carousel;

FIG. 30 illustrates an alternative embodiment of the robot arm;

FIG. 31 illustrates an alternative mechanism for registering the carousel and registering the retaining arm; and

FIG. 32 is a cross sectional view taken along line 32—32 of FIG. 31 also showing the alternative embodiment for the carousel and the retaining arm.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, with particular attention to FIG. 1, there is shown a disc changer according to the present invention generally designated by the reference numeral 10. The changer 10 includes a loading station 12 where one or more discs 14 to be played may be stacked on a spindle 16 and a play station 18 wherein one of the discs 14 is rotated and information encoded on the bottom side of the disc is read by a playing mechanism 20 that includes a movable reading head 19 that includes an optical reader 21; however, other types of readers, for example, a magnetic or other type of reader, can be used depending on the type of disc being read. Also, a writing mechanism capable of writing digital or other information magnetically, optically, thermally or otherwise onto a disc can be used if a writing or recording capability is to be provided. The playing mechanism 20 is a standard playing mechanism that is used in compact disc players and is available from various manufacturers, including Sony Corporation and Philips Corporation among others.

The changer 10 also includes a discard station 22 wherein discs 14 that have been played are stacked about a spindle 24. A robot arm 26 that has a pick-up head 28 rotates in the clockwise direction when viewed from the top to pick up a disc 14 from the loading station 12 to the play station 18 wherein the disc 14 is played. After play, the disc is transported by the arm 26 to the discard station 22 where it is discarded. After the played disc has been discarded, the robot arm 26 is again rotated to the loading station 12 where another disc 14 is picked up and transported to the play station. A fixed shield 30 and a movable shield 32 that rotates with the robot arm 26 prevent access to the disc 14 during play at the play station 18. However, either of these shields may be transparent to provide a view of the disc 14 during play. The shield 32 has a downwardly-extending post 33 that cooperates with three registering posts 34, 36 and 38 that serve to register the robot arm in the play, discard and loading positions, respectively, as will be discussed in a subsequent portion of the specification. Three centrally located posts 39 prevent the arm 26 from being lowered when it is positioned between stations. The robot arm 26 is driven by a motor 40 via a pair of pulleys 42 and 44 and a drive belt 46. A pinion gear 48 is fixed to the pulley 44 and drives a cam and clutch assembly 50 that rotates the robot arm 26 between stations and raising it at the loading, play and discard stations.